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HITT GAINES P.C.
P.O. BOX 832570
RICHARDSON, TX 75083

EXAMINER	
STEELMAN, MARY J	
ART UNIT	**PAPER NUMBER**
2122	7

DATE MAILED: 02/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/809,499	HOLZMANN, GERARD J.	
	Examiner	Art Unit	
	Mary J. Steelman	2122	

-- The MAILING DATE of this communication appears n the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04/24/01,04/23/01,05/07/01,06/23/01*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03/15/01 & 06/23/01* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-23 are pending

Drawings

2. Drawings were received on 04/23/2001 and 06/23/2001. These drawings need corrections and / or clarification as noted below:

3. Drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description:

Figure 1, missing # 30 in Specification.

Figure 2, missing # 52 and #58 in Specification.

Figure 3, missing #102 in Specification. See page 15, line 4.

A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

4. Regarding figure 1, received 06/23/2001, it is unclear whether the arrow should leave #16 and go directly to both #17 and #18. It is also unclear whether the "Process Translation" block should be #19 or #19N.

Specification

5. The specification has been amended, per Applicant's request, Amendment A, received 05/07/2001.

6. The use of the trademark JAVA has been noted in this application. It should be capitalized wherever it appears and be accompanied by the generic terminology.

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

7. Page 10, line 13, recites, "nul", should be –null--

Claim Objections

8. Claim 10, line 4, recites, "nul", should be –null--.

Claim 14, line 2, recites, "nul", should be –null--.

Claim 17, line 2, recites, "nul", should be –null--.

Claim 17, line 4, recites "nodes", should be –nodes--.

Claim Rejections - 35 USC § 112

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. Claims 10, 13, 16, and 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

11. The terms "fully relevant / irrelevant / partially relevant / relevant" in claim 10 are relative terms which renders the claim indefinite. The terms "fully relevant / irrelevant / partially relevant / relevant" are not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

12. The term "equivalent " in claim 13 is a relative term which renders the claim indefinite. The term "equivalent" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

13. The term "simplifying" in claim 16 is a relative term which renders the claim indefinite. The term "simplifying" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

14. The term "based on relevancies between the certain properties and the source code statements" in claim 19 is a relative term which renders the claim indefinite. The term "relevancies" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Claim Rejections - 35 USC § 102

15. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for

> patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

16. Claims 1-18, and 23 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent 6,330,530 to Horiguchi et al.

Per claim 1:

-generating a parse tree defining a control flow from the source code; identifying source code elements; from the parse tree, generating source strings for selected ones of the source code elements; (See fig. 2B. Col. 7, lines 5-7, "Syntactic analysis module uses parsing grammar to create a syntax parse tree for the sentence.")

-defining corresponding default conversions for translating the source strings into a target language of a model checker; (Fig. 3, #220 and fig. 7A. Col. 8, lines 64-65, "...transfer model searches bilingual example database for matches (default conversions)...")

-generating a verification model in the target language wherein the verification model conforms to the control flow and to the corresponding default conversions for the selected ones of the source code elements. (See fig. 2A. Col. 5, line 56-col. 6, line 12, "All rule bodies utilized by the grammars of language translation system are in the form of computer-executable routines produced by defining the grammar in terms of a grammar programming language (verification model) and passing appropriate rule bodies through a GPL compiler. The output may be in the form of directly executable code..." Also col. 8, lines 17-22, "...the resulting transfer generation tree is used by transfer module to match the feature structure against the

example database." Also, col. 9, lines 28-34, "...Matching module searches thesaurus to fine the most specific thesaurus entry that dominates a thesaurus code from each representation (verification)." Col. 12, line 54, "...generate target language feature structure..." and col. 13, lines 10-14, "The process blocks of fig. 8 and fig. 9 would be applied to word or slot until a good match is found...recursively executed until a match of the entire SLS is processed.")

Per claim 2:

-optionally searching a conversion table for an entry associated with at least one of the source strings, the entry including a translation for the at least one of the source strings; (Claim 7, lines 50-52, "Transfer module uses GPL rule bodies within transfer grammar to match the input source sub-structures of slots to the source...in example database...")

-substituting the translation for the corresponding default conversion for the at least one of the source strings, wherein the verification model further conforms to the translation. (Col. 8, lines 7-8, "If the application of each rule succeeds, a child rule-node...is added to tree. If the application fails, the s-node is tagged as 'dead' for subsequent removal...")

Per claim 3:

-source code elements include basic statements and Boolean conditionals. (Col. 9, lines 1-5, "...for example, full sentences, ("How do you do?", "May I help you?") (Boolean), verb-phrases ("I have an appointment.", "I have dinner") (basic statements) , ...)

Per claim 4:

-generating of source text strings includes the further step of expressing the source text strings in a canonical form. (Col. 3, lines 39-46, "The grammar rules are recursively applied to the SLS sub-structures from a top-most transfer rule until all SLS sub-structures (source) within the SLS are transferred to corresponding TEF sub-structures (target)..." Grammar rules are used to omit redundant white space or insert / delete certain characters, providing for unambiguous precedence (canonical form).)

Per claim 5:

-specifics of the corresponding default conversions can depend on a usage of the selected ones of the source code elements. (Col. 6, lines 50-52, "The feature structures built by morphological analysis module are input into lexical ambiguity reduction module..." Col. 12, lines 34-39, "If an exact match is not found, thesaurus matching system is used to define how good a match has been found..." Col. 13, lines 44-46, "Matching module searches thesaurus to fine the most specific thesaurus entry that dominates a thesaurus code from each representation. Matching module retrieves previously calculated relative entropy values from slots...")

Per claim 6:

-conversion table further includes samples of source strings. (Col. 8, lines 64-65, "...transfer module searches bilingual example database (samples of source strings) for matches...")

Per claim 7:

-conversion table further includes classes of source strings. (col. 6, lines 16-19, "A morphological analysis module takes text input and uses a source language dictionary to decompose the words into morphemes by identifying root forms, grammatical categories, and other lexical features of the words.", and col. 11, lines 1-7, "...example database may change as the context of the language changes. That is, example database changes as the context changes between travel language, medical language, legal language...(classes of source strings)")

Per claim 8:

-searching of the conversion table includes the step of pattern matching the at least one of the source strings to the samples of source strings. (Col. 6, lines 16-19, "A morphological analysis module takes text input and uses a source language dictionary to decompose (for pattern matching)...", col. 6, lines 64-67, "Lexical ambiguity reduction module weighs the cost assigned to each word in the sentence and selects (pattern matching) those feature structures that have the lowest cost.")

Per claim 9:

-searching of the conversion table includes the step of pattern matching the at least one of the source strings to the classes of source strings. (Col. 11, lines 1-7, "...example database may change as the context of the language changes...travel language, medical language, legal language...")

Per claim 10:

-corresponding default conversions causes the translating of the source strings to respective equivalent statements in the target language when the selected ones of the source code elements are fully relevant to a property to be tested, the translating of the source strings to null statements in the target language when the selected ones of the source code elements are irrelevant to the property to be tested, and the translating of the source strings to preservation statements in the target language when the selected ones of the source code elements are partially relevant to the property to be tested, preservation statements being statements that preserve a relevant part of the source strings and that suppress an irrelevant part of the source strings. (Col. 8, lines 5-22, "Transfer grammar rules added to tree are applied to the s-nodes. If the application of each rule succeeds (use default conversion)...If the application fails (irrelevant) ...The process is repeated until all sub-features (break down into sub-features when partially relevant) in the target language associated with a match are substituted for the corresponding ...in the source language." and col. 10, lines 1-4, "When no match is found, a number of back-up rules within grammar are applied...(use variety of rules if exact match is not found)")

Per claim 11:

-generating a verification model step includes the further step of translating ones of the source strings to a non-deterministic choice of possible outcomes. (Col. 5, line 65-col. 6, line 5, "All rule bodies utilized by the grammars of language translation system are in the form of computer-executable routines produced by defining the grammar in terms of a grammar programming language (GPL) and passing appropriate rule bodies through a GPL compiler (verification model). The output of the GPL compiler may be in the form of directly executable code..."

Also, col. 6, lines 57-67, "Each possible combination (choice of possible outcomes) of adjacent segmented words are assigned a lexical cost. Dictionary defines combinations of words...Lexical ambiguity reduction module evaluates each feature structures that contains a part-of-speech ambiguity...selects those feature structures that have the lowest cost.")

Per claim 12:

-generating a verification model step includes the step of populating the control flow with the translated source strings. (Col. 8, lines 19-22, "The feature structures and sub-structures in the target language associated with a match are substituted...", and col. 8, lines 49-56, "The leaf nodes contain output feature structures that represent valid sentences when the syntactical generation tree is complete. The sequence of output feature structures that represents the best sentence is converted into output text by using the dictionary, and the thesaurus...")

Per claim 13:

-default conversion includes a keep, the keep causing the generating of a verification model step to provide an equivalent statement in the target language. (Col. 8, lines 7, "If the application of each rule succeeds, a child rule-node is added to tree...")

Per claim 14:

-default conversion comprises a hide, the hide causing the generating of a verification model step to provide a null statement in the target language. (Col. 8, lines 8-10, "If the application fails, the s-node is tagged as 'dead' for sub-sequent removal.")

Per claim 15:

- default conversion comprises a print, the print causing the generating of a verification model step to embed the respective source strings in a print statement in the target language." (Col. 10, lines 1-5, "When no match is found, a number of back-up rules within grammar are applied to allow a simple, rule-based treatment of the unmatched slot or syntactic structure. For example, to allow a direct transfer (embed / print the source string in the target) or to delete the structure.")

Per claims 16 and 17:

-simplifying step includes the steps of: removing nodes corresponding to null statements; removing nodes successive to false nodes; skipping selected nodes mapped to true. (Col. 8, lines 7-10 and 14-19, "If the application of each rule succeeds...If the application fails...Transfer generation tree is then pruned (simplifying, remove nodes corresponding to null statements) to remove any 'dead' nodes and corresponding sub-trees. If root is tagged as 'dead,' the generation fails. Otherwise, the resulting transfer generation tree is used by transfer module to match the feature structure...")

Per claim 18:

- collecting certain data object information for nodes in the parse tree corresponding to basic statements in the source code, the certain data object information including definition information and use information; (Col. 6, lines 21-25, "Feature structures are well known in the art as linguistic data structures that contain feature-value pairs (definition information and use

information) for strings, symbols, and numbers that appear in a natural language sentence. Each feature of a word is mapped to the appropriate value...", col. 7, lines 9-18, "Each leaf of the syntax parse tree is a feature structure for one of the words in the sentence. Once the leaves are created, an intermediate feature structure for each branch node in the syntax parse tree is built...The rule body for each potentially applicable context-free rule could create a valid phrase from the possible combinations...")

-constructing a data dependency graph for the source code based upon the collected data object information, the data dependency graph having data dependency graph nodes corresponding to a data object, the data dependency graph having directed edges from first data dependency graph nodes to successive data dependency graph nodes if the successive data dependency graph nodes are used at least, once in a definition of the first data dependency graph nodes; (Col. 10, lines 9-13, "Source language example feature structure may include a number of source language example slots. Each slot may in turn contain a number of nested slots (dependencies) ...")

-determining a transitive closure for the data dependency graph dependency relation; (Col. 7, line 10, "Each leaf (last node of a branch) of the syntax parse tree is a feature structure for one of the words in the sentence.")

-adding edges to the data dependency graph according to the transitive closure, the adding step providing a second data dependency graph; (See nested sub-structures (second dependency graph), col. 10, lines 9-13.)

-for nodes corresponding to basic statements in the source code having translations other than hide or print, marking second data dependency graph data objects with identifiers corresponding to the definition information and the use information; (Col. 6, line 21, "feature-value pairs")

-for nodes corresponding to basic statements in the source code having a hide translation; marking second data dependency graph data objects with a hide identifier; checking the second data dependency graph, data objects for identifiers and the hide identifier. (Col. 8, lines 8-10, "If the application of each rule succeeds, a child rule-node is added to tree...if the application fails, the s-node is tagged as 'dead' for subsequent removal." And lines 15-16, "...pruned to remove any 'dead' nodes and corresponding sub-trees (second data dependency graph data objects

Per claim 23:

A method for extracting a verification model from source code having a control flow, comprising the steps of:

-generating selected source strings from the source code; (See fig. 2B. Col. 7, lines 5-7, "Syntactic analysis module uses parsing grammar to create a syntax parse tree for the sentence.")

-translating ones of the selected source strings to corresponding target language statements according to default conversions; (Fig. 3, #220 and fig. 7A. Col. 8, lines 64-65, "...transfer model searches bilingual example database for matches (default conversions)..." Col. 12, line 54, "...generate target language feature structure..." and col. 13, lines 10-14, "The process

blocks of fig. 8 and fig. 9 would be applied to word or slot until a good match is found...recursively executed until a match of the entire SLS is processed.")

-optionally searching a conversion table for entries associated with the selected source strings, the conversion table including a plurality of translations associated with various ones of the source strings; (Col. 9, lines 28-34, "Transfer grammar executes thesaurus matching system...Matching module searches thesaurus to find the most specific thesaurus entry that dominates a thesaurus code from each representation (plurality of translations associated with ones of the source strings)...")

-translating other ones of the selected source strings to corresponding target language statements according to the entries; (Col. 9, lines 28-34, "...Matching module searches thesaurus to fine the most specific thesaurus entry that dominates a thesaurus code from each representation (verification)." Also, col. 13, lines 10-14, "The process blocks of fig. 8 and fig. 9 would be applied to word or slot until a good match is found...recursively executed until a match of the entire SLS is processed. (other ones)")

-populating the control flow with the target language statements. (Col. 8, lines 19-22, "The feature structures and sub-structures in the target language associated with a match are substituted (populating)...", and col. 8, lines 49-56, "The leaf nodes contain output feature structures that represent valid sentences when the syntactical generation tree is complete. The

sequence of output feature structures that represents the best sentence is converted into output (target language statements) text by using the dictionary, and the thesaurus...")

Claim Rejections - 35 USC § 103

17. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

18. Claims 19 –22 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,330,530 to Horiguchi et al., in view of "Temporal Proof of the Behavior of Sequential Machines", by Janine Magnier, Mireille Larnac, and Vincent Chapurlat, 1997 IEEE, pages 258-261.

Horiguchi disclosed a grammar programming language compiler that verifies the translation of words / strings from a source language to a target language by parsing into data structures, matching or otherwise analyzing for correctness. Horiguchi disclosed:

-abstracting the source code statements based upon relevancies between the certain properties and the source code statements, expressing an input language for a model checker, checking for the certain properties in the model checker (See claim 1).

-a table of translations for translating other selected source code elements based

upon defined abstractions; a translator responsive to the translations of the selected source code elements and the other selected source code elements; a model checker responsive to the certain properties. (See claims 1 and 2.)

-the model extractor further includes a parser for constructing a parse tree from the source code, wherein the translator translates source strings generated from the parse tree. (See claim 1.)

-the model extractor further operates to provide a control flow from the parse tree and to populate the control flow with translated source strings. (See claim 1.)

Horiguchi failed to disclose the concept of "finite state models".

However, Magnier, Larnac, and Chapurlat provided a discussion on a formal verification method for discrete time state systems...illustrated on the classical Finite State Machine (FSM) model. See page 258, right column, 2nd paragraph, "Proving that the system verifies a given property comes down to study the validity or satisfiability of the associated logico-temporal formula within the axiomatic..." Page 260, section 4, "The properties one may want to verify on the behavior of a FSM model ...

Therefore, it would have been obvious, to one of ordinary skill in the art, at the time of the invention, to have modified Horiguchi's invention to include finite state models, because Horiguchi did go through a process of verification, including a process of assigning a lexical cost (col. 6, line 58) each time a word / string did not have a 'exact' match. Horiguchi simply neglected to identify each step of the process as a "state".

Conclusion

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mary Steelman, whose telephone number is (703) 305-4564. The examiner can normally be reached Monday through Thursday, from 7:00 A.M. to 5:30 P.M. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Dam can be reached on (703) 305-4552.

The fax phone number is (703) 872-9306 for regular communications and for After Final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

Mary Steelman

02/05/2004

TUAN DAM
SUPERVISORY PATENT EXAMINER